
2002 IEEE International Geoscience and Remote Sensing Symposium and the 24th Canadian Symposium on Remote Sensing
REMOTE SENSING: Integrating Our View of the Planet
IGARSS 2002
IEEE
June 24-28, 2002
Toronto Canada

Status of Terra MODIS and Aqua MODIS

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Abstract- Launched on December 18, 1999, the MODIS ProtoFlight Model on-board the EOS Terra spacecraft (near sun-synchronous polar orbit, 10:30 am equator crossing time) has been providing the science community global data sets for over two years. The instrument has been performing well on-orbit in terms of its spatial and spectral characterization and radiometric calibration. Many science products have been developed and validated using the MODIS Level 1B calibrated data. To be launched in April 2002, the MODIS Flight Model 1 on the EOS Aqua spacecraft (1:30 pm equator crossing time) will enhance the MODIS products by providing afternoon observations.

I. Introduction

The MODerate Resolution Imaging Spectroradiometer (MODIS) is the key instrument on NASA's Earth Observing System (EOS) Terra and Aqua spacecraft. The MODIS ProtoFlight Model (PFM) was launched on-board the Terra spacecraft on December 18, 1999 in a near sun-synchronous polar orbit (descending southward, 10:30 am equator crossing time). The instrument nadir door was first opened on February 24, 2000. The instrument has been providing the science community global data sets for over two years. Overall, the instrument has been performing well in terms of its spatial and spectral characterization and radiometric calibration based on the on-orbit observations. Most of the land, oceans, and atmosphere science products developed from the Terra MODIS L1B calibrated data sets have been validated and put in use by a broad user community. In April 2002, MODIS Flight Model 1 (FM1) will be launched on the EOS Aqua spacecraft (ascending northward, 1:30 pm equator crossing time). This new mission will complement the Terra MODIS data sets by proving afternoon observations.

II. Instrument Overview

MODIS has 36 spectral bands ranging from 0.4-14.5 μm, distributed on four focal plane assemblies (VIS, NIR, SW/MWIR, and LWIR) with nadir spatial resolutions of 250m (bands 1-2), 500m (bands 3-7), and 1000m (bands 8-36). The operating temperature of the two cold FPAs (SW/MWIR, and LWIR) is controlled by a passive radiatiive cooler. Using a two-sided scan mirror, the instrument provides a 10 km (nadir) along track by 2330 km crosstrack swath every 1.478 seconds. The 20 reflective solar bands (RSB) are spectrally located between 0.4 and 2.1 μm. The wavelengths of 16 thermal emissive bands (TEB) range from 3.75-14.5 μm.

MODIS on-orbit calibrators include a solar diffuser (SD) and a solar diffuser stability monitor (SDSM) for the RSB radiometric calibration, a blackbody (BB) for the TEB radiometric calibration, and a Spectroradiometric Calibration Assembly (SRCA) for spatial and spectral characterization. A detailed description of the MODIS instrument characterization and pre-launch calibration results have been reported by Barnes, Pagano and Salomonson [1].

V. Summary and Conclusions

In summary, the Terra MODIS is an excellent sensor that has already provided more than 400 terrabytes of science data in over 40 global products spanning the period from November 2001 to the present. On-orbit performance has verified the pre-launch tests indicating that the sensor has met all but a very few of the large number of demanding specifications. Test data from the Aqua MODIS promises somewhat better performance than the Terra model. The Aqua satellite is slated for launch in April 2002. The combined data from the AM and PM MODIS should greatly enhance our ability to study the Earth as a system.